



REMARKS

Claims 1 through 5, 7 through 32 and 58 through 63 are currently pending in the application.

Claims 1, 10, 58 and 62 are amended.

This amendment is in response to the final Office Action of October 9, 2003.

35 U.S.C. § 103(a) Rejections

Obviousness Rejection Based on Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863)

Claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863). Applicant respectfully traverses this rejection, as hereinafter set forth.

Applicant respectfully submits that Dery and Higgins are not analogous art. In order to be analogous art, the reference must either be in the field of Applicant's endeavor or reasonably relevant to the specific problem being addressed by Applicant. In re Oetiker, 977 F. 2d 1443, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992).

Higgins is arguably not in the field of Applicant's endeavor. Both are semiconductor-related. However, Higgins is concerned with the formation of electrically conductive elements of a semiconductor assembly, while Applicant's invention pertains to the mechanical strength of the assembly.

Higgins is irrelevant to the specific problem addressed by Applicant's invention. The problem addressed by Applicant can generally be described as "how to promote adhesion between plastics and substrates." Higgins, on the other hand, is a method of forming conductive bumps on substrates. The only thing Applicant's invention and the references have in common is the application of a layer of epoxy resin or polyimide over a semiconductor substrate. From there, they diverge, as Applicant requires a thin layer of the aforementioned substances to promote adhesion over the entire surface of a plastic underfill layer, and Higgins' layer, which contains 70 to 85 volume percent conductive filler, is selectively removed, almost completely, to

leave scant traces of the original layer as conductive bumps. Higgins does not recognize the problems solved by Applicant's invention.

Applicant further respectfully submits that in combining Dery and Higgins, such combination fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed invention. Applicant submits that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure.

Applicant respectfully submits that there is no teaching or suggestion in either of the references or the knowledge available to "one skilled in the art" to combine the epoxy resin or polyimide layer of Dery with a liquid method of application of Higgins. As a matter of fact, Higgins teaches away from such a combination: Higgins teaches, in Col. 6, lines 15 through 20, a layer which is heavily impregnated (70 to 85 percent by volume) with conductive materials in order to form "conductive bumps." One skilled in the art would not want to apply such a layer over a substrate in the process of Dery because, being conductive, the layer would provide conductive paths along the substrate or the semiconductor device to which the layer is attached. These paths would electrically interconnect the solder bumps attached to a given surface, a result which would destroy the function of the semiconductor device assembly.

Furthermore, successful adhesion is uncertain as it is unclear whether the layer of Higgins, so heavily filled with conductive particles, would provide the adhesive benefits, and superior wetting ability of Applicant's layer in the claimed invention. Finally, because it is unlikely that the layer of Higgins, which is only 15 to 30 percent "wetting compound," (Col. 6, lines 16 through 20) actually acts to reduce surface tension as a "wetting layer." It is entirely possible that the large amounts of conductive metal fillers (Col. 5, lines 8 through 25) required would have the same low affinity for the flowable material that the silicon substrate does, and

thus Higgins' mix of metal and wetting compound would not itself actually function as a wetting compound. Applicant thus respectfully submits that the element "applying a liquid-wetting agent layer to one of said surface of said semiconductor device and said surface of said substrate" is not taught or suggested in any combination of the cited prior art. Applicants thus submit that claims 1, 10 and 58 are allowable, with claims 2, 4, 5, 7, 9, 11, 12, 15, 22, 59 and 60 allowable as depending from allowable independent claims.

Obviousness Rejection Based on Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 and further in combination with Plueddemann (U.S. Patent 4,231,910)

Claims 3, 8 and 61 through 63 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 and further in combination with Plueddemann (U.S. Patent 4,231,910). Applicant respectfully traverses this rejection, as hereinafter set forth. Applicants respectfully submit that claims 3, 8 and 61 through 63 are allowable due to the improper combination of Dery and Higgins, as elucidated in the prior obviousness rejection.

Furthermore, the combination of Dery and Higgins with Plueddemann does not establish a *prima facie* case of obviousness under 35 U.S.C. § 103 because Plueddemann cannot be seen as teaching the additional claim limitation of "wherein said liquid wetting agent layer includes a layer of Silane-based material" (or its equivalent) in the rejected claims. In fact, the concept of a "wetting layer" (silane-based or not) is not a part of Plueddemann. Consider that in Col. 1, lines 13 through 27, Plueddemann makes it clear that organo silanes have not been successful in enhancing the adhesion between solid substrates and thermoplastics because thermoplastics harden without forming any new bonds to the silane. Thermosetting resins, on the other hand, are a different case because they *form new bonds upon heat setting and curing* which can bond to functional groups of the silane. From these facts alone, it should be clear that regardless of whether or not Applicant uses a thermoplastic resin or a thermosetting resin, Plueddemann

cannot be seen as teaching adhesion of *anything* to a silane-based *wetting* layer because any enhanced bonding referred to in the reference is due to curing. It is not due to a wetting layer which lowers the surface tension of a material flowing across it.

In order to make explicit the inherent contact between the flowable material and the wetting layer, the Applicant has amended claims 1, 10, 58 and 62 to require the contact. Support can be found in the specification at pages 10 and 11, where the contact is set forth in detail.

The claim limitation of the wetting layer being “silane-based” is also not met because, as can be seen in Plueddemann, Col. 3, lines 1 through 9, the composition which would be characterized as a “wetting layer” would actually be a combination of a silane and other components, with the silane part being only 1 to 25 percent by weight.

Applicant thus respectfully submits that 3, 8, 61 through 63 are allowable.

Obviousness Rejection Based on Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 supra, and further in combination with Akram (U.S. Patent 5,766,982)

Claims 13, 14, 16 through 21 and 23 through 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 supra, and further in combination with Akram (U.S. Patent 5,766,982). The arguments set forth above pertaining to the improper combination of Dery and Higgins are applicable here as there is no suggestion whatsoever for any combination thereof to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed invention and even if combined, do not teach or suggest all the claim limitations of the claimed invention. Applicants thus submit that claims 13, 14, 16 through 21 and 23 through 30 are allowable.

Obviousness Rejection Based on Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 supra, and further in combination with Banerji (U.S. Patent 5,203,076)

Claims 31 and 32 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dery (U.S. Patent 6,074,895) and Higgins (U.S. Patent 5,492,863) as applied to claims 1, 2, 4, 5, 7, 9 through 12, 15, 22 and 58 through 60 supra, and further in combination with Banerji (U.S. Patent 5,203,076). Applicant respectfully traverses this rejection, as hereinafter set forth. The arguments set forth above pertaining to the improper combination of Dery and Higgins are applicable as there is no suggestion whatsoever for any combination thereof to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed invention and even if combined, do not teach or suggest all the claim limitations of the claimed invention.. Applicants thus submit that claims 31 and 32 are allowable.

Applicant requests entry of this amendment for the following reasons:

The amendment is timely filed.

The amendment places the application in condition for allowance.

The amendment does not require any further search or consideration.

In summary, Applicant submits that claims 1 through 5, 7 through 32 and 58 through 63 are clearly allowable over the cited prior art for the reasons set forth herein.

Applicant requests the entry of this amendment, the allowance of claims 1 through 5, 7 through 32 and 58 through 63, and the case passed for issue.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "James R. Duzan". The signature is fluid and cursive, with a long horizontal stroke at the end.

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